

PATENT COOPERATION TREATY

WO 00/69001
PCT/GB00/016

PCT

From the INTERNATIONAL BUREAU

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:
BARKER BRETTELL
138 Hagley Road
Edgbaston
Birmingham B16 9PW
ROYAUME-UNI

Date of mailing (day/month/year) 16 November 2000 (16.11.00)		
Applicant's or agent's file reference DAW465		
IMPORTANT NOTICE		
International application No. PCT/GB00/01619	International filing date (day/month/year) 08 May 2000 (08.05.00)	Priority date (day/month/year) 07 May 1999 (07.05.99)
Applicant CRANFIELD UNIVERSITY et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AG,AU,DZ,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 16 November 2000 (16.11.00) under No. WO 00/69001

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

Form PCT/IB/303 (July 1996)

3646041

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/GB 00/01619

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L41/09

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 537 446 A (ASULAB SA) 21 April 1993 (1993-04-21) abstract; figures 1-6	1-4
Y	US 4 845 688 A (BUTLER JOHN L) 4 July 1989 (1989-07-04) abstract	1-4
Y	US 5 729 077 A (DOGAN AYDIN ET AL) 17 March 1998 (1998-03-17) abstract; figure 3	1-3

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

31 August 2000

Date of mailing of the international search report

07/09/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5018 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Pelsters, L

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. l. Application No

PCT/GB 00/01619

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0537446	A	21-04-1993	CH 685183 A DE 69206570 D DE 69206570 T JP 5211787 A US 5233257 A	13-04-1995 18-01-1996 14-08-1996 20-08-1993 03-08-1993
US 4845688	A	04-07-1989	AU 3368989 A WO 8909531 A	16-10-1989 05-10-1989
US 5729077	A	17-03-1998	AU 1344897 A EP 0867043 A WO 9722154 A	03-07-1997 30-09-1998 19-06-1997

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum)

DAW465

Box No. I TITLE OF INVENTION

Improvements in or relating to Ultrasonic Motors

Box No. II APPLICANT

Name and address: *Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below*

**Cranfield University
Cranfield
Bedfordshire
MK43 0AL
GB**

☐ This person is also inventor

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality

GB

State (that is, country) of residence

GB

This person is applicant
for the purposes of:

☐

all designated
States

☒

all designated States except the
United States of America

☐

the United
States of
America only

☐

the States indicated in
the supplemental box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below*

**Rayner, Philip John
c/o Cranfield University
Cranfield
Bedfordshire MK43 0AL
GB**

This person is

☐

applicant only

☒

applicant and inventor

☐

inventor only (If this check-box is
marked, do not fill in below.)

State (that is, country) of nationality

GB

State (that is, country) of residence

GB

This person is applicant
for the purposes of:

☐

all designated
States

☐

all designated States except the
United States of America

☒

the United States
of America only

☐

the States indicated in
the supplemental box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒

agent

☐

common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

**BARKER BRETTELL
138 Hagley Road
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Birmingham
B16 9PW
GB**

Telephone No.

+44 (0) 121 456 1364

Facsimile No.

+44 (0) 121 456 1368

Teleprinter No.

337898

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent

Continuation of Box No. III		FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
<i>If none of the following sub-boxes is used, this sheet should not be included in the request.</i>			
Name and address: <i>Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below)</i> Whatmore, Roger William c/o Cranfield University Cranfield Bedfordshire MK43 0AL GB		This person is <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
State (that is, country) of nationality GB		State (that is, country) of residence GB	
This person is applicant for the purposes of: <input type="checkbox"/> all designated States		<input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the supplemental box	
Name and address: <i>Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below)</i>		This person is <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
State (that is, country) of nationality		State (that is, country) of residence	
This person is applicant for the purposes of: <input type="checkbox"/> all designated States		<input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the supplemental box	
Name and address: <i>Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below)</i>		This person is <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
State (that is, country) of nationality		State (that is, country) of residence	
This person is applicant for the purposes of: <input type="checkbox"/> all designated States		<input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the supplemental box	
Name and address: <i>Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below)</i>		This person is <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
State (that is, country) of nationality		State (that is, country) of residence	
This person is applicant for the purposes of: <input type="checkbox"/> all designated States		<input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the supplemental box	
Name and address: <i>Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below)</i>		This person is <input type="checkbox"/> applicant only <input type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)	
State (that is, country) of nationality		State (that is, country) of residence	
This person is applicant for the purposes of: <input type="checkbox"/> all designated States		<input type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the supplemental box	
<input type="checkbox"/> Further applicants and/or (further) inventors are indicated on another continuation sheet.			

Box No. V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked)

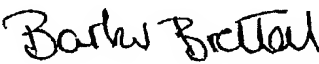
Regional Patent

- ☒ **AP** **ARIPO Patent:** GH Ghana, GM Gambia, KE, Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW, Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☒ **EA** **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☒ **OA** **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line)

- | | |
|---|---|
| <input checked="" type="checkbox"/> AE United Arab Emirates | <input checked="" type="checkbox"/> LR Liberia |
| <input checked="" type="checkbox"/> AL Albania | <input checked="" type="checkbox"/> LS Lesotho |
| <input checked="" type="checkbox"/> AM Armenia | <input checked="" type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria | <input checked="" type="checkbox"/> LU Luxembourg |
| <input checked="" type="checkbox"/> AU Australia | <input checked="" type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MA Morocco |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BG Bulgaria | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BR Brazil | |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CR Costa Rica | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic | <input checked="" type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany | <input checked="" type="checkbox"/> RO Romania |
| <input checked="" type="checkbox"/> DK Denmark | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> DM Dominica | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> EE Estonia | <input checked="" type="checkbox"/> SE Sweden |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> FI Finland | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SK Slovakia |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> SL Sierra Leone |
| <input checked="" type="checkbox"/> GE Georgia | <input checked="" type="checkbox"/> TJ Tajikistan |
| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TM Turkmenistan |
| <input checked="" type="checkbox"/> GM Gambia | <input checked="" type="checkbox"/> TR Turkey |
| <input checked="" type="checkbox"/> HR Croatia | <input checked="" type="checkbox"/> TT Trinidad and Tobago |
| <input checked="" type="checkbox"/> HU Hungary | <input checked="" type="checkbox"/> TZ United Republic of Tanzania |
| <input checked="" type="checkbox"/> ID Indonesia | <input checked="" type="checkbox"/> UA Ukraine |
| <input checked="" type="checkbox"/> IL Israel | <input checked="" type="checkbox"/> UG Uganda |
| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> US United States of America |
| <input checked="" type="checkbox"/> IS Iceland | |
| <input checked="" type="checkbox"/> JP Japan | <input checked="" type="checkbox"/> UZ Uzbekistan |
| <input checked="" type="checkbox"/> KE Kenya | <input checked="" type="checkbox"/> VN Viet Nam |
| <input checked="" type="checkbox"/> KG Kyrgyzstan | <input checked="" type="checkbox"/> YU Yugoslavia |
| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> ZA South Africa |
| | <input checked="" type="checkbox"/> ZW Zimbabwe |
| <input checked="" type="checkbox"/> KR Republic of Korea | Check-boxes reserved for designating States which have |
| <input checked="" type="checkbox"/> KZ Kazakhstan | become party to the PCT after issuance of this sheet: |
| <input checked="" type="checkbox"/> LC Saint Lucia | <input checked="" type="checkbox"/> DZ Algeria |
| <input checked="" type="checkbox"/> LK Sri Lanka | <input checked="" type="checkbox"/> AG Antigua and Barbuda |

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	regional application:* regional Office	international application receiving Office
item (1) 07.05.99	9910483.8	United Kingdom	X	
item (2)				
item (3)				
<input type="checkbox"/> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving office) identified above as item(s): * Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.				
Box No. VII INTERNATIONAL SEARCHING AUTHORITY				
Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA/		Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority): Date (day/month/year) Number Country (or regional Office)		
Box No. VIII CHECK LIST; LANGUAGE OF FILING				
This international application contains the following number of sheets:		This international application is accompanied by the item(s) marked below:		
request	: 4	1. <input type="checkbox"/> fee calculation sheet:		
description (excluding sequence listing part)	: 14	2. <input type="checkbox"/> separate signed power of attorney		
claims	: 5	3. <input type="checkbox"/> copy of general power of attorney; reference number, if any:		
abstract	: 1	4. <input type="checkbox"/> statement explaining lack of signature		
drawings	: 5	5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):		
sequence listing part of description	: 0	6. <input type="checkbox"/> translation of international application into (language):		
		7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material		
		8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form		
Total number of sheets	29	9. <input type="checkbox"/> other (specify):		
Figure of the drawings which should accompany the abstract: 1		Language of filing of the international application English		
Box No. IX SIGNATURE OF APPLICANT OR AGENT				
Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).				
 Barker Brettell				

For receiving Office use only	
1. Date of actual receipt of the purported international application:	2. Drawings:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:	<input type="checkbox"/> received:
4. Date of timely receipt of the required corrections under PCT Article 11(2):	<input type="checkbox"/> not received:
5. International Searching Authority ISA/ (if two or more are competent):	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid.

Date of receipt of the record copy by the International Bureau:	For International Bureau use only
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PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

INFORMATION CONCERNING ELECTED
OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

BARKER BRETTELL
138 Hagley Road
Edgbaston
Birmingham B16 9PW
ROYAUME-UNI

DD
DAW

Date of mailing (day/month/year) 11 January 2001 (11.01.01)		
Applicant's or agent's file reference DAW465		
IMPORTANT INFORMATION		
International application No. PCT/GB00/01619	International filing date (day/month/year) 08 May 2000 (08.05.00)	Priority date (day/month/year) 07 May 1999 (07.05.99)
Applicant CRANFIELD UNIVERSITY et al		

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

AP : GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE

National : AG, AU, BG, CA, CN, CZ, DE, DZ, IL, JP, KP, KR, MN, NO, NZ, PL, RO, RU, SE, SK, US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

EA : AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

OA : BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

National : AE, AL, AM, AT, AZ, BA, BB, BR, BY, CH, CR, CU, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IN, IS, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MW, MX, PT, SD, SG, SI, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW

3. The applicant is reminded that he must enter the "national phase" before the expiration of 30 months from the priority date before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing, if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

The entry into the European regional phase is postponed until 31 months from the priority date for all States designated for the purposes of obtaining a European patent.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Form PCT/IB/332 (September 1997)

Authorized officer:

Pascal Pirou

Telephone No. (41-22) 338.83.38

3767933

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7:

H01L 41/09

A1

(11) International Publication Number:

WO 00/69001

(43) International Publication Date: 16 November 2000 (16.11.00)

(21) International Application Number:

PCT/GB00/01619

(22) International Filing Date:

8 May 2000 (08.05.00)

(30) Priority Data:

9910483.8

7 May 1999 (07.05.99)

GB

(71) Applicant (for all designated States except US): CRANFIELD UNIVERSITY [GB/GB]; Cranfield, Bedfordshire MK43 0AL (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): RAYNER, Philip, John [GB/GB]; Cranfield University, Cranfield, Bedfordshire MK43 0AL (GB). WHATMORE, Roger, William [GB/GB]; Cranfield University, Cranfield, Bedfordshire MK43 0AL (GB).

(74) Agent: BARKER BRETTELL; 138 Hagley Road, Edgbaston, Birmingham B16 9PW (GB).

(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

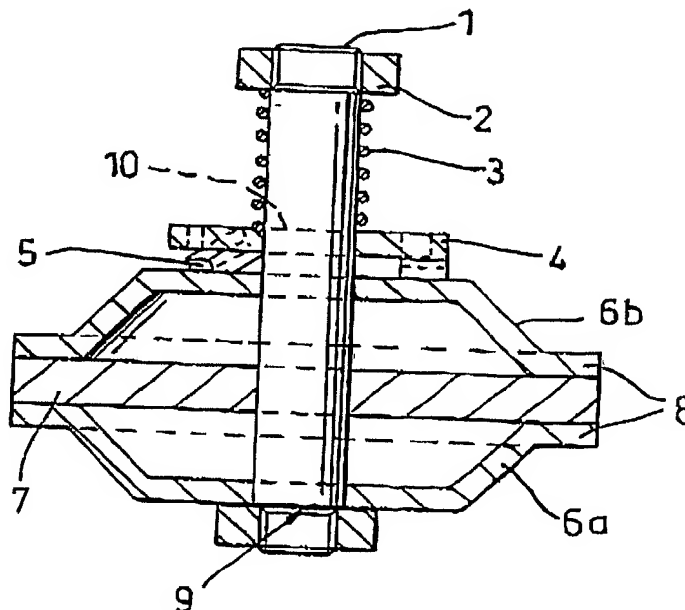
With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: IMPROVEMENTS IN OR RELATING TO ULTRASONIC MOTORS

(57) Abstract

An ultrasonic motor is described which uses radial vibrations of an electro-active material disc (7) amplified by one or more flexensional diaphragms (6) to drive a rotor (4) pressed in frictional contact with the diaphragm (6) by a force imposed by a spring (3) or magnetic attraction. The vibrations are converted by elastic fins (5) into rotary motion of the rotor (4). The motor can be operated in any resonant mode that generates vibration at the surface perpendicular to the contact area. Versions of the motor with one or two rotors are disclosed with the two rotor version being used to produce an output in the same direction or opposite directions.



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European Patent Office
D-80298 Munchen
Germany

For the attention of PCT Section

Your ref.

Our ref.
DAW465

Please reply to Birmingham
26 June 2001

Dear Sirs

International Patent Application No. PCT/GB00/01619
Cranfield University

In reply to the Written Opinion issued 5 April 2001 an International Preliminary Examination of the above-mentioned application enclosed herein is:

Amended Claims 1 – 25 (pages 15 – 19) in triplicate.

Response

It is submitted that all the claims are now allowable with Claim 1 and meet the requirements of Article 33 (2), (3) and (4) PCT. Favourable re-consideration of the amended claims is requested.

Yours faithfully,

Enc.

id

RESPONSE

PCT PATENT APPLICATION NO. PCT/GB00/01619 CRANFIELD UNIVERSITY

1. This response is in reply to the Written Opinion issued 5 April 2001 on International Preliminary Examination of the above-noted application.
2. The Examiner is requested to amend the specification on file as follows:

IN THE CLAIMS – cancel pages 15 to 19 containing claims 1 to 28 and insert replacement pages 15 to 19 provided herewith in triplicate, being amended claims 1 to 25.

3. In reply to point VIII of the report, the following comments are provided:-
 - 3.1 Claims 23 to 25 have been deleted and claims 26 to 28 re-numbered in line with the amendments. Amended claims 1 to 25 remain in the application with a single independent claim, claim 1, and claims 2-25 dependent through to claim 1. In addition, the claims have been amended to include reference numerals to identify the features of the claims from the description. It is submitted that the amended claims comply with Article 6 PCT and Rules 6.4 PCT and Rule 6.2(b) PCT.

- 3.2. The term "at least one flextensional displacement amplifier diaphragm" in claim 1 is supported by disclosure in the original application of arrangements having one diaphragm (see page 7, lines 26,27) or two diaphragms (see Figures 1 to 11 and the corresponding description). It is submitted that disclosure of an arrangement having one diaphragm is sufficient basis for the term "at least one" used in claim 1 and that the applicant is entitled to claim this feature without limitation to the exact number of diaphragms shown and described in the exemplary embodiments. The purpose of the claims is to define the scope of protection while that of the description is to support the claims and provide adequate disclosure for a person skilled in the art to put the invention into practice. It is not a requirement that the scope of the claims be limited exactly to the precise arrangements disclosed for putting the invention into practice and the original disclosure provides the necessary support for the term "at least one flextensional displacement amplifier diaphragm".
- 3.3. Transmission of motion via frictional contact at a diaphragm/rotor interface in claim 1 is supported in the original application by the disclosure in all of the embodiments of elastic fins for this purpose (for example, see page 2, lines 12 to 27 and page 6, line 26 to page 7, line 20). The operation of these fins is fully described with reference to Figures 8 and 9 and it is submitted that this description provides complete support for the reference to "frictional contact" in claim 1.
- 3.4. The term "one or more rotors" in claim 12 is supported by the disclosure in the original application of arrangements having one rotor (see the description of Figures 1 to 4 and Figure 10) and two rotors (see the description of Figures 5 to 7 and Figure 11). It is submitted that disclosure of an arrangement having one rotor is sufficient basis for the term "one or more" used in claim 12 and that the applicant is entitled to claim this feature without limitation to the exact number of rotors shown and described in the exemplary embodiments. As previously stated,

the purpose of the claims is to define the scope of protection while that of the description is to support the claims and provide adequate disclosure for a person skilled in the art to put the invention into practice. It is not a requirement that the scope of the claims be limited exactly to the precise arrangements disclosed for putting the invention into practice and the original disclosure provides the necessary support for the term "one or more rotors". The same remarks apply to claim 15.

- 3.5. Claim 13 has been amended to recite use of "iron, nickel or cobalt or their alloys" as the rotor material consistent with the description on page 13, lines 6-11 of the application as filed. A similar amendment has been made to claim 12 and support for this is also provided by the same part of the description.
- 3.6. Claim 20 has been amended to recite that the fins make contact between the rotating component and the diaphragm of the stationary component. Support for this is provided by the description of Figures 1 to 11 in the application as filed.
4. In reply to point V of the report, the following comments are provided:-
 - 4.1 It is noted that the subject matter of Claim 1 is considered to be novel over the cited documents D1,D2,D3 and to meet the requirements of Article 33(2) PCT. For the reasons now explained, it is submitted that the subject matter of claim 1 also involves an inventive step over the disclosures of documents D1,D2,D3 and meets the requirements of Article 33(3) PCT.
 - 4.2. The present invention concerns an ultrasonic motor in which oscillating vibrations are converted into rotary motion through frictional contact at an interface between relatively rotatable components of the rotor. The motor has a disc of electro-active material and at least one displacement amplifier diaphragm for converting radial vibrations of the disc into oscillating vibrations of the

diaphragm. Rotors are provided opposite the diaphragm(s) and elastic fins provided on the diaphragm(s) are in frictional contact with the rotors. The elastic fins convert the vibrations of the diaphragm into rotational motion of the rotor by frictional contact on the upward stroke, driving the rotor horizontally, and the elastic fin slipping on the surface of the rotor on the downward stroke imparting no motion on the rotor.

- 4.3 Document D1 (EP 0 537 446 A) discloses an ultrasonic motor but there is no disclosure of diaphragm(s) amplifying the displacement of the stator.
- 4.4 Document D2 (US 4 845 688 A) discloses a device for the generation of sound in an acoustic medium. The device uses a flextensional mechanical amplifier to increase the volumetric change in an acoustically active device. In D2, the amplifiers are used to push on diaphragms and head/tail masses to make a volumetric change. This document is leading in the direction of acoustic transducers and it is not obvious from D2 that the principle of the flextensional displacement amplifier can be used to generate rotary motion. In particular, D2 refers to "transducer shells" (column 2, lines 46-63) which are essentially a component of acoustic transducers and there is absolutely no reference in D2 to "diaphragms having amplifying effects on stator vibrations" as asserted in the written opinion. Stators are essentially a component of piezoelectric ultrasonic motors and D2 does not refer to any arrangement which could be considered a piezoelectric ultrasonic motor. The construction of a piezoelectric ultrasonic motor using a flextensional amplifier requires a completely different conformation of design from the acoustic transducer of D2 including the placement of an axle and bearings. It is clear that D2 does not suggest the use of an amplifier diaphragm in the manufacture of a piezoelectric ultrasonic motor.
- 4.5 Document D3 (US 5 729 077) discloses flextensional amplifiers used to generate linear displacements when combined in a stack. It is clear from Figure 6 that this

is for low frequency, quasi-DC application. It is not obvious from this that the combination of a resonating disc and a flextensional amplifier would provide a good driver for a rotating element. It is not suggested in D3 that placing a rotor with fins in contact with some other portion of the flextensional amplifier would make a good driver. Moreover, in the present invention, the axle for the motor goes through the centre of the amplifier but from D3 the displacement of the amplifier at this point would be expected to be at a maximum. It is clear that D3 does not disclose an arrangement useful to the manufacture of a piezoelectric ultrasonic motor.

- 4.6. Contrary to the view expressed in the written opinion, it is submitted that the subject matter of claim 1 involves an inventive step over the disclosures of documents D1, D2 and D3 and that claim 1 meets the requirements of Article 33(3) PCT. In particular, there is absolutely no teaching in the cited documents to suggest combining the disclosures of either documents D1 and D2 or documents D1 and D3 to produce an ultrasonic motor comprising displacement amplifiers, a rotor and a disc made of electro-active material as defined in claim 1. Furthermore, in view of the different nature of the disclosures in the cited documents, a person of ordinary skill in the art would not have considered combining the documents in the manner suggested without knowledge of the present invention. As such the combination of the cited documents to arrive at the present invention is clearly the result of an impermissible ex post facto analysis of the prior art.
- 4.7 Claims 2 to 25 are dependent through to claim 1 and define further preferred features of the invented ultrasonic motor. It is submitted that all of these claims are allowable with claim 1 and meet the requirements of Article 33(2), (3) and (4) PCT.

5. Favourable re-consideration of the amended claims in the light of the foregoing comments is requested.

Barker Brettell
Agents for the Applicant

CLAIMS

1. An ultrasonic motor in which radial vibrations of a disc of electro-
active material (7,11) are converted via at least one flextensional
5 displacement amplifier diaphragm (6a,6b,13) into vibrations of the or each
diaphragm (6a,6b,13) perpendicular to the plane of the disc (7,11), said
diaphragm vibrations then being converted into rotary motion via
frictional contact at a diaphragm/rotor interface (6b/4,11/14).
- 10 2. An ultrasonic motor as claimed in claim 1 wherein the disc of
electro-active material (7,11) is a piezoelectric material, with an electrode
of a conductive material deposited on each circular face of the disc.
3. An ultrasonic motor as claimed in 1 wherein the disc of electro-
15 active material (7,11) is an electrostrictive material, with an electrode of a
conductive material deposited on each circular face of the disc.
4. An ultrasonic motor as claimed in 1 wherein the disc of electro-
active material (7,11) is a magnetostrictive material excited by an
20 oscillating magnetic field.
5. An ultrasonic motor as claimed in any preceding claim wherein the
disc of electro-active material (7,11) is of a multi-layer construction with
one or more layers of electro-active material interleaved with layers of
25 conductive electrode material.
6. An ultrasonic motor as claimed in any preceding claim wherein the
or each flextensional displacement amplifier diaphragm (6a,6b,13) is

bonded to the surface of the electro-active disc (7,11) with an epoxy or a metal loaded epoxy.

7. An ultrasonic motor as claimed in any one of claims 1 to 5 wherein
5 the or each flextensional displacement amplifier diaphragm (6a,6b,13) is bonded to the surface of the electro-active disc (7,11) with an anaerobic adhesive or modified anaerobic adhesive.
8. An ultrasonic motor as claimed in any one of claims 1 to 5 wherein
10 the or each flextensional displacement amplifier diaphragm (6a,6b,13) is soldered or diffusion bonded to the surface of the electro-active disc (7,11).
9. An ultrasonic motor as claimed in any preceding claim wherein a
15 respective diaphragm (6a,6b) is attached to each side of the disc (7) and a single rotor (4) positioned opposite one of the diaphragms (6b) turns about an axle(1) which is attached to the other diaphragm (6a).
10. An ultrasonic motor as claimed in any one of claims 1 to 8 wherein
20 a respective diaphragm (6a,6b) is attached to each side of the disc (7) and a respective rotor (4a,4b) is arranged opposite each diaphragm (6a,6b) of which one rotor (4b) is attached to an axle and the other (4a) can slide axially along the axle.
- 25 11. An ultrasonic motor as claimed in any one of claims 1 to 8 wherein an axle (1) is attached to the electro-active material disc (7,11) and one or more rotors (4a,4b,13) turn about said axle (1) on bearings (10,17).

12. An ultrasonic motor as claimed in any preceding claim wherein one or more rotors (4a,4b,14) are held in contact with the displacement amplifier diaphragms' (6a,6b,13) oscillating surfaces utilising magnetic attraction, when this magnetic attraction is brought about by the rotors (4a,4b,14) having a remnant magnetic polarisation and the diaphragms (6a,6b,13) being made of ferromagnetic materials, such as the metals Iron, Nickel or Cobalt or their alloys.
13. An ultrasonic motor as claimed in any one of claims 1 to 11 wherein one or more rotors (4a,4b,14) are held in contact with the displacement amplifier diaphragms' (6a,6b,13) oscillating surfaces utilising magnetic attraction, when this magnetic attraction is brought about by the diaphragms (6a,6b,13), having a remnant magnetic polarisation and the rotors (4a,4b,14) being made of ferromagnetic materials, such as the metals Iron, Nickel, or Cobalt or their alloys.
14. An ultrasonic motor as claimed in any one of claims 1 to 11 wherein one or more rotors (4a,4b,14) are held in contact with the displacement amplifier diaphragms' (6a,6b,13) oscillating surfaces utilising magnetic attraction, when this magnetic attraction is brought about by an electromagnet winding.
15. An ultrasonic motor as claimed in any one of claims 1 to 11 wherein one or more rotors (4a,4b,14) are held in contact with the diaphragms (6a,6b,13) by one or more springs.
16. An ultrasonic motor as claimed in 1 wherein the displacement amplifier (6a,6b,13) diaphragm and electro-active disc (7,11) assembly is

the rotating component and the rotor (4a,4b,14) is the stationary component.

17. An ultrasonic motor as claimed in 1 wherein the displacement
5 amplifier diaphragm (6a,6b,13) and electro-active disc (7,11) assembly is the stationary component and the rotor (4a,4b,14) is the rotating component.

18. An ultrasonic motor as claimed in any preceding claim wherein a
10 layer or structure of an elastic material is attached to the surface of the rotor/diaphragm interface (5,5a,5b).

19. An ultrasonic motor as claimed in any preceding claim wherein
15 elastic fins (5,5a,5b) are provided at the interface that each have a fin tip which contacts the friction interface such that, the fin tip has an instantaneous rotation about a rotation point not in line with the fin tip contact point in the direction of rotation, thus causing a horizontal friction reaction which drives the rotor (4,4a,4b,14) on the expansive stroke of the displacement amplifier (6a,6b,13), yet allows the fin to relax on the
20 downstroke and the fin tip to slide on the friction interface.

20. An ultrasonic motor as claimed in claim 19 wherein the elastic fins
(5,5a,5b) make a contact at an oblique angle to the surface of the friction interface between the rotating component and the diaphragm (6a,6b,13) of
25 the stationary component.

21. An ultrasonic motor as claimed in claim 19 or claim 20 wherein the elastic fins (5,5a,5b), which make contact with the friction interface, have one or more curved sections in their length.

22. An ultrasonic motor as claimed in claim 19 or claim 20 wherein the elastic fins (5,5a,5b), which make contact with the friction interface, have at least two straight sections that are joined in at an angle.

5

23. An ultrasonic motor as claimed in any preceding claim wherein the or each flextensional amplifier diaphragm (6a,6b,13) is dish-shaped with an upset central region.

10 24. An ultrasonic motor as claimed in claim 23 wherein the central region is spaced from the plane of the disc.

25. An ultrasonic motor as claimed in claim 23 wherein the central region (13a) is contained within the plane of the disc.

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

1 IPEA/ _____

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only	
Identification of IPEA	Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION	
Applicant's or agent's file reference DAW465	
International application No. PCT/GB00/01619	International filing date (day/month/year) 08 May 2000
(Earliest) Priority date (day/month/year) 07 May 1999	
Title of invention Improvements in or relating to Ultrasonic Motors	
Box No. II APPLICANT(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) Cranfield University Cranfield Bedfordshire MK43 0AL GB	
Telephone No.:	
Facsimile No.:	
Teleprinter No.:	
State (that is, country) of nationality: GB	State (that is, country) of residence: GB
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) RAYNER, Philip John c/o Cranfield University Cranfield Bedfordshire MK43 0AL GB	
State (that is, country) of nationality: GB	State (that is, country) of residence: GB
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) WHATMORE, Roger William c/o Cranfield University Cranfield Bedfordshire MK43 0AL GB	
State (that is, country) of nationality: GB	State (that is, country) of residence: GB
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.	

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.
☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*BARKER BRETTELL
138 Hagley Road
Edgbaston
Birmingham B16 9PW
GB

Telephone No.:

0121-456-1364

Facsimile No.:

0121-456-1368

Teleprinter No.:

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION**

Statement concerning amendments: *

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed
the description ☐ as originally filed
☐ as amended under Article 34the claims ☐ as originally filed
☐ as amended under Article 19 (together with any accompanying statement)
☐ as amended under Article 34the drawings ☐ as originally filed
☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English

- ☒
- which is the language in which the international application was filed.
-
- ☐
- which is the language of a translation furnished for the purposes of international search.
-
- ☐
- which is the language of publication of the international application.
-
- ☐
- which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATESThe applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Sheet No. 3

International application No.
PCT/GB00/01619

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | | |
|--|---|-------|--------|
| 1. translation of international application | : | _____ | sheets |
| 2. amendments under Article 34 | : | _____ | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | _____ | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | _____ | sheets |
| 5. letter | : | _____ | sheets |
| 6. other (specify) | : | _____ | sheets |

For International Preliminary Examining Authority use only

received	not received
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input checked="" type="checkbox"/> other (specify): <u>fee voucher to Debit Deposit Account</u> |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

D. A. Wightman
D. A. Wightman
Professional Representative
Barker Brettell

For International Preliminary Examining Authority use only

- Date of actual receipt of DEMAND:
- Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
- ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.
 ☐ The applicant has been informed accordingly.
- ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
- ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

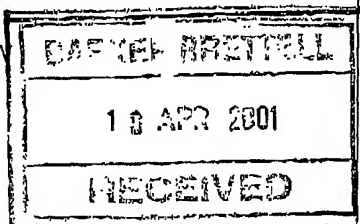
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Demand received from IPEA on:

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
BARKER BRETTELL
138 Hagley Road
Edgbaston
BIRMINGHAM, B16 9PW
GRANDE BRETAGNE



PCT

WRITTEN OPINION

(PCT Rule 66)

Applicant's or agent's file reference DAW465		Date of mailing (day/month/year) 05.04.2001
International application No. PCT/GB00/01619		REPLY DUE within 2 month(s) from the above date of mailing
International filing date (day/month/year) 08/05/2000	Priority date (day/month/year) 07/05/1999	
International Patent Classification (IPC) or both national classification and IPC H01L41/09		
Applicant CRANFIELD UNIVERSITY et al.		

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain document cited
 - VII ☐ Certain defects in the international application
 - VIII ☒ Certain observations on the international application
3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **07/09/2001**.

Name and mailing address of the International preliminary examining authority:

European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer / Examiner
Van den Berg, G

Formalities officer (incl. extension of time limits)
Schuster-Kaechele, W
Telephone No. +49 89 2399 2281



WRITTEN OPINION

International application No. PCT/GB00/01619

I. Basis of the opinion

1. With regard to the **elements** of the international application (Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"):

Description, pages:

1-14 as originally filed

Claims, No.:

1-28 as originally filed

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

WRITTEN OPINION

International application No. PCT/GB00/01619

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N) Claims 1 - 28: yes

Inventive step (IS) Claims 1 - 28: no

Industrial applicability (IA) Claims 1 - 28: yes

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**WRITTEN OPINION
SEPARATE SHEET**

International application No. PCT/GB00/01619

To point VIII:

The underlying international application does not meet the requirements of Article 6 PCT:

1. Although claims 1 and 23 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness. Moreover, lack of clarity of the claims as a whole arises, since the plurality of independent claims makes it difficult, if not impossible, to determine the matter for which protection is sought, and places an undue burden on others seeking to establish the extent of the protection. Hence, claims 1 and 23 do not meet the requirements of Article 6 PCT.

In order to overcome this objection, it would appear appropriate to file an amended set of claims defining the relevant subject-matter in terms of a single independent claim followed by dependent claims covering features which are merely optional (Rule 6.4 PCT).

2. Furthermore, the wording of claim 1 is not supported by the description to the extent that the latter provides for one or two flexensional displacement amplifier diaphragms (cf. page 1, lines 23, 24; all embodiments). The observation also applies to the subject-matter of claim 23.

It further seems that the same in the embodiments according to figures 10 and 11, transmission of motion from stator to rotor is of flexional nature (by portions "5") rather than by friction.

3. Apart from that, claim 12 specifies "one or more rotors" held in contact with displacement amplifier diaphragms. This definition is not supported by the description which only provides for two rotors (cf. all embodiments). The observation also applies to the wording of claim 15.

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Claim 13 is not clear because according to the description the rotors are made of ferromagnetic material such as the metals Ni, Fe and Co "and their alloys" or "alloys" thereof (cf. description, page 13, lines 6 - 13).

Claim 20 does not express that the elastic fins make a contact at an oblique angle to the surface of the friction interface between the rotating component and the diaphragm of the stationary component (cf. figures 8 and 9).

4. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

To point V:

Reference is made to the following documents:

D1 = EP 0 537 446 A

D2 = US 4 845 688 A

D2 = US 5 729 077 A

Document D1 describes an ultrasonic motor in which radial vibrations of a stator disc 8 material are concerted into vibrations perpendicular to the disc which vibration are then converted into rotary motion of the rotor 30 via frictional/flexional contact 36 at the stator/rotor interface (cf. page 1, corresponding text). The document is silent about a diaphragm amplifying the displacement of the stator.

In document D2, an electro-mechanical spring transducer is disclosed in which either piezoelectric or magnetostrictive members provide motion that is magnified by a flextensional induced bending motion for providing large displacements. The spring in the form of a diaphragm connected to an electro-active disc amplifies the motion of the active material such that as the (here) piezoelectric stack oscillates, the head mass moves with magnified motion (and the head mass produces radiation into the medium (cf. D2, e.g. figure 2, 3; column 6, lines 5 -

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58). The spring or shell can be made from a high strength material such as aluminum, steel, glass reinforced plastic or a fiber composite (cf. D2, column 8, lines 32 - 37).

Document D3 relates to electro-active ceramic transducers exhibiting large positional displacements by using a spring or metal clip in the form of a diaphragm attached to the electro-active disc.

1. (Novelty)

Insofar as the claims can be understood (cf. point VIII above), the subject-matter of claims 1 and 23 is not anticipated by the available prior art because none of the documents D1, D2 or D3 discloses all features included in either of these claims. Therefore, the subject-matter of claims 1 and 23 would meet the requirement of Article 33(2) PCT.

2. (Inventive step)

According to document D1, the vibrational motion of the stator disc is readily converted in a direction perpendicular to the plane of the disc (and thus also perpendicular to the plane of the rotor) and then by into a rotary motion of the rotor. The subject-matter of claim 1 (23) would therefore differ from the disclosure of D1 only in that according to claim 1 (23) one or two (flexensional) displacement amplifier diaphragm(s) is/are used to amplify the motion of the stator. As it is understood from figures 1 - 8, it is the medium between diaphragm and rotor which causes the rotor to rotate whereas the diaphragm has a mere amplifying function. Diaphragms having such amplifying effects on stator vibrations are however widely known in the art as it can be seen from e.g. either document D2 or D3. The subject-matter of claims 1 and 23 would therefore be rendered obvious by an evident combination of teaching of either D1 and D2 or D1 and D3. The subject-matter of claims 1 and 23 would not meet the requirement of Article 33(3) PCT.

In the case of the embodiments according to figures 10 and 11, there is no motion converting medium between rotor and diaphragm such that the flexensional diaphragm would both amplify the motion of the stator and convert it into a rotary motion of the rotor. This solution would not be rendered obvious by the available

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prior art because diaphragms shown in e.g. D2 or D3 do not convert the translational motion of the stator into a rotary motion D2 and D3. Such subject-matter would meet the requirement of Article 33(3) PCT.

3. (Industrial applicability)

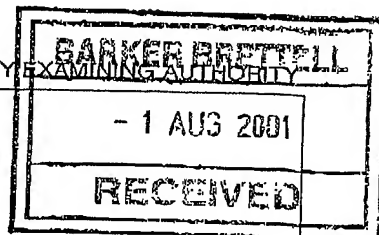
The subject-matter of claims 1 - 28 meets the requirement of Article 33(4) PCT

In view of the above comments, at present no evaluation is given on the dependent claims under Article 33(2), (3) and (4) PCT.

If new claims be filed, the applicant is requested to clearly identify the amendments carried out, no matter whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based in order to facilitate the examination of the conformity of the amended application with the requirements of Article 34(2)(b) PCT (see also Rule 66.8(a) PCT).

If the applicant regards it as appropriate these indications could be submitted in handwritten form on a copy of the relevant parts of the application as filed.

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY



To:

BARKER-BRETTELL
138 Hagley Road
Edgbaston
BIRMINGHAM, B16 9PW
GRANDE BRETAGNE

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing
(day/month/year) 30.07.2001

Applicant's or agent's file reference
DAW465

IMPORTANT NOTIFICATION

International application No.
PCT/GB00/01619

International filing date (day/month/year)
08/05/2000

Priority date (day/month/year)
07/05/1999

Applicant
CRANFIELD UNIVERSITY et al.

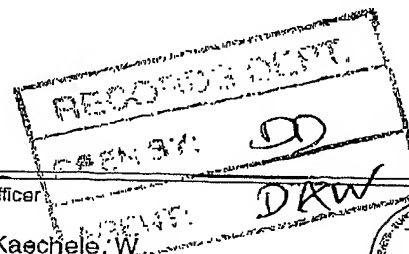
1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER


The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference DAW465	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/01619	International filing date (day/month/year) 08/05/2000	Priority date (day/month/year) 07/05/1999
International Patent Classification (IPC) or national classification and IPC H01L41/09		
Applicant CRANFIELD UNIVERSITY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
 - ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 07/12/2000	Date of completion of this report 30.07.2001
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80296 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Van den Berg, G  Telephone No. +49 89 2399 2499

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/01619

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-14 as originally filed

Claims, No.:

1-25 as received on 03/07/2001 with letter of 03/07/2001

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
 - ☐ the language of publication of the international application (under Rule 48.3(b)).
 - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority in written form.
 - ☐ furnished subsequently to this Authority in computer readable form.
 - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
 - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.
4. The amendments have resulted in the cancellation of:
- ☐ the description, pages:
 - ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/01619

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1 - 25
	No:	Claims	none
Inventive step (IS)	Yes:	Claims	1 - 25
	No:	Claims	none
Industrial applicability (IA)	Yes:	Claims	1 - 25
	No:	Claims	none

2. Citations and explanations
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/01619

To point V:

Reference is made to the following documents:

D1 = EP 0 537 446 A

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Document D1 describes an ultrasonic motor in which radial vibrations of a stator disc 8 material are converted into vibrations perpendicular to the disc which vibration are then converted into rotary motion of the rotor 30 via frictional/flexional contact 36 at the stator/rotor interface (cf. D1, page 1, figure 1 corresponding text). The document is silent about a diaphragm amplifying the displacement of the stator.

In document D2, an electro-mechanical spring, acoustic transducer is disclosed in which either piezoelectric or magnetostrictive members provide motion that is magnified by a flexensional induced bending motion for providing large displacements. The spring in the form of a diaphragm connected to the electro-active disc amplifies the motion of the active material such that as the piezoelectric stack oscillates, the head mass moves with magnified motion (and the head mass produces radiation into the medium (cf. D2, e.g. figure 2, 3; column 6, lines 5 - 58). The spring or shell can be made from a high strength material such as aluminum, steel, glass reinforced plastic or a fiber composite (cf. D2, column 8, lines 32 - 37).

Document D3 relates to electro-active ceramic actuators exhibiting large linear displacements by using a spring or metal clip in the form of a diaphragm attached to the electro-active disc.

1. (Novelty)

The subject-matter of claim 1 is not anticipated by the available prior art because none of the documents D1, D2 or D3 discloses all features included in claim 1.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/01619

Therefore, the subject-matter of claim 1 meets the requirement of Article 33(2) PCT.

2. (Inventive step)

According to document D1, the vibrational motion of the stator disc is readily converted in a direction perpendicular to the plane of the disc (and thus also perpendicular to the plane of the rotor) and then into rotary motion of the rotor. The subject-matter of claim 1 differs from the disclosure of D1 in that according to claim 1 at least one (flextensional) displacement amplifier diaphragm(s) is/are used to amplify the motion of the stator and to generate rotary motions through the medium between diaphragm and rotor.

Diaphragms having amplifying effects are widely known in the art. However, in document D2 there is no hint to use flextensional amplifiers to generate rotary motion or to diaphragms having amplifying effects on stator vibrations. Nor does document D3 suggest to combine a resonating disc and a flextensional amplifier to provide a driver for the rotary element.

The subject-matter of claim 1 is therefore not considered to be rendered obvious by a (hypothetical) combination of teachings of either those of D1 and D2 or those of D1 and D3.

Consequently, the subject-matter of claim 1 and hence that of dependent claims 2 - 25 meet the requirement of Article 33(3) PCT.

3. (Industrial applicability)

The subject-matter of claims 1 - 25 meets the requirement of Article 33(4) PCT.

To point VIII:

In claims 12 and 13, the term "such as ..." has no limiting effect on the scope of these claims (cf. Guidelines for preliminary international examination, C-III, 4.6).